

REMARKS

Applicants respectfully request reconsideration of this application. Entry of the new claims is respectfully requested inasmuch as it places the claimed subject matter in better form for consideration on appeal.

Claims 1-20 are presently in the application.

The present invention relates to an oligomerization process in which hydrocarbon feedstocks that include sulfur-containing molecules are contacted with a hydrotreating catalyst in the absence of hydrogen and in the liquid phase. The catalyst is a heterogeneous catalyst selected from supported reduced metals, metal oxides, metal sulfides and combinations thereof. Preferred catalysts include mixed nickel and molybdenum oxides or mixed cobalt and molybdenum oxides. The process can oligomerize sulfur compounds so that sulfur-containing feedstocks can be treated without deactivating the catalysts. Accordingly, untreated refinery streams can be used as oligomerization feedstocks without preliminary desulfurization.

New claim 16 has been added to include the limitation wherein the hydrocarbon feedstock comprises 100 ppm to 10000 ppm (1%) sulfur-containing molecules, support for which can be found in the specification at page 6, line 2, page 11, line 7 and page 3, line 27. New claim 17 has been added to include the limitation wherein the hydrocarbon feedstock comprises dienes, support for which can be found in the specification at page 6, line 19. New claim 18 has been added to include the limitation wherein the hydrocarbon feedstock comprises 20-120 ppm dienes, support for which can be found in the specification at page 9, lines 27-28 and page 12, lines 1-2. New claims 19 and 20 have been added to include the limitation wherein the hydrocarbon feedstock is selected from untreated refinery streams such as light FCC gasoline, coker streams and pygas streams. Support for this can be found at page 7, lines 8-10.

Rejection Under 35 U.S.C. § 112

Claim 14 has been rejected under 35 USC 112, first paragraph, as containing subject matter which was not described in the specification in a way to convey to one skilled in the art that the inventors had possession of the claimed invention at the time

the application was filed. With regard to the lower limit of 50 ppm, not specifically recited in the specification, the Examiner has argued that "case law such as *In re Wertheim* is applied to determine obviousness with respect to the 'claims' and not the specification which is required to support all limitations contained in the claims."

This rejection is respectfully traversed.

Applicants respectfully submit that with respect to changing numerical range limitations, the Examiner's analysis in accordance with MPEP 2163.05 (III) must take into account, which ranges one skilled in the art would consider inherently supported by the discussion in the original disclosure. In the decision in *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976), the ranges described in the original specification included a range of "25%-60%" and specific examples of "36%" and "50%." A corresponding new claim limitation to "at least 35%" did not meet the description requirement because the phrase "at least" had no upper limit and caused the claim to read literally on embodiments outside the "25% to 60%" range, however a limitation to "between 35% and 60%" did meet the description requirement. Similarly, the present application discloses sulfur levels of 10-100 ppm at page 6, line 2, so that one skilled in the art would consider claim 14's range of "from greater than 50 to 100 ppm" inherently supported by the specification. Moreover, there is no basis to argue that claims 14's range reads on embodiments outside the disclosed 10-100 ppm range. Accordingly, it is respectfully submitted that claim 14 meets the requirements of 35 USC 112, first paragraph. In view of this, it is respectfully requested that the Examiner withdraw his rejection of claim 14 under 35 USC 112.

Rejections Under 35 U.S.C. § 103(a)

Claims 1-15 have been finally rejected under 35 USC § 103(a) as being unpatentable over newly cited U.S. Patent No. 4,788,376 to Mazurek et al. (Mazurek) in view of U.S. Patent No. 5,157,201 to Norris.

This rejection is respectfully traversed. Applicants maintain their earlier arguments respecting this rejection made in their response mailed May 25, 2001. However, applicants wish to strengthen those arguments by noting an error at page 4,

lines 21-26 of that response. That passage incorrectly refers to Mazurek as disclosing sulfur removal rather than Norris.

The Examiner bases his rejection on an argument that one skilled in the art would arrive at the present invention based on Mazurek's oligomerization process and Norris' teaching that a typical propylene feedstock normally contains from about 5-50 ppm of various sulfur species that can be incorporated in higher olefins produced during oligomerization. Yet Norris' invention is solely directed to removing sulfur from feeds using metal oxides to *adsorb* sulfur species (column 4, lines 24-25) at low temperatures of 50° to 175°C (122° to 347°F) (column 4, lines 39-40), rather than treating at the presently claimed temperatures of 392° to 600°F. Thus, one skilled in the art would not simply substitute a sulfur-containing propylene feed in the process of Mazurek, but would employ an adsorbent at moderate temperatures as taught by Norris.

To otherwise interpret Norris disregards the teaching of the reference as a whole. It is well understood that the teaching of a reference *as a whole* should be considered. In *In re Wesslau*, 353 F.2d 238, 147 USPQ 391 (CCPA 1965), the court cautioned that "it is impermissible within the framework of section 103 to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In *Bausch & Lomb, Inc. v. Barnes-Hind/Hydrocurve, Inc.*, 796 F.2d 443, 230 USPQ 416 (Fed. Cir. 1986), *cert. denied*, 484 U.S. 823 (1987), *on remand*, 10 USPQ2d 1929 (N.D. Calif. 1989), the Federal Circuit held that a single line in a prior art reference should not be taken out of context and relied upon with the benefit of hindsight to show obviousness. Rather, a reference should be considered as a whole, and portions arguing against or teaching away from the claimed invention must be considered.

Because Norris teaches feeds with relatively low sulfur content, its combination with Mazurek fails to disclose or suggest, *a fortiori*, the subject matter of present claims 12, 14 and 16 which require greater than 50 ppm sulfur, 50 ppm being the upper limit of sulfur taught by Norris as being the "typical propylene feedstock" (column 1, lines 41-42).

The Examiner has stated at page 4 of his office action that "applicants have not demonstrated the criticality of 1% sulfur in the feed." However, the advantage of a process capable of operating with such high sulfur feeds is quite manifest from a commercial standpoint inasmuch as the present process can dispense with costly sulfur removal treatments prior to olefin oligomerization. Examples 3 and 5 of the present application show operation of the invention with 1 wt.% thiophene feeds being converted at more than 95% conversion of thiophene to oligomers.

The Examiner's statement bridging pages 4 and 5 that "[a]pplicants' 95% sulfur conversion would naturally result from the process produced by the combined teachings of Mazurek et al. and Norris because the same conditions and feed amounts would yield a similar conversion percentage" is incorrect. One skilled in the art applying Norris to Mazurek would not employ the high temperatures required by the present invention inasmuch as Norris suggests the adsorption of sulfur-containing species at low temperatures as discussed above.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present invention is neither disclosed nor suggested by the combination of Mazurek and Norris. Accordingly, withdrawal of this rejection is respectfully requested.

Claims 1-5 and 8-15 have been finally rejected under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 4,098,839 to Wilms et al. (Wilms) in view of Norris. Wilms is cited as disclosing oligomerization of C₂-C₅ olefins over a catalyst containing molybdenum and cobalt and/or nickel supported on alumina which is activated in an oxidizing atmosphere to provide metal oxides. Wilms describes a catalyst "substantially insensitive to sulfur . . . components in the olefin feedstocks" (column 2, lines 10-12) and teaches feedstocks containing 50 ppm sulfur (column 6, lines 21-22). Norris is also cited as teaching that higher olefin plants typically use a propylene feedstock which normally contains 5-50 ppm of various sulfur species, and that sulfur species are incorporated into higher olefins during oligomerization.

The Examiner concludes it would be obvious to oligomerize sulfur- and propylene-containing feedstocks with the catalysts specified in the present claims in view of Wilms because Norris teaches use of 5-50 ppm sulfur-containing feeds for

oligomerization as well as incorporation of sulfur into higher olefins during oligomerization. The Examiner argues selecting any combination of metals and metal oxides would be obvious to one skilled in the art, including applicants' NiMo/alumina or mixed NiMo or CoMo oxides given the reference teaching that such catalysts are known to accomplish the desired conversion.

This rejection is respectfully traversed.

Wilms oligomerizes unsaturated hydrocarbons with a molybdenum sulfide catalyst which has been treated in an *oxidizing* atmosphere at 300°-700°C to provide "an intermediate phase between molybdenum oxide and molybdenum sulfide [which] constitutes the active component of the catalyst" (column 3, lines 10-13). Applicants note that Wilms provides comparative Examples 4 and 5 using supported MoO₃ catalyst and MoS₂ catalyst, respectively, to process a feed containing 50 ppm sulfur. However, Wilms teaches that the product yield obtained in the absence of sulfur in the feed "had almost the same composition than the one obtained by Example 1" [with 50 ppm sulfur in the feed] (column 6, lines 26 to 31) which teaches away from the present invention's process which oligomerizes sulfur-containing molecules as set out in present claim 3. The Examiner has argued that "conversion product differences between a non-sulfur containing feed and a sulfur containing feed are not the subject of applicants' claims" and that one "can not distinguish the claims by differences not defined in the claims." However, applicants respectfully submit that such differences are defined in the claims because claim 3 *requires* oligomerizing sulfur compounds which would result in differences between products formed in the absence or presence of sulfur. In contrast, Wilm's products in the absence or presence of sulfur are described as "almost the same" (column 6, line 30).

Moreover, the combination of Wilms and Norris fails to disclose or suggest the higher operating temperatures required by the present claims. Wilms discloses oligomerizing at relatively low temperatures of 40°-180°C (104°-358°F). Similarly, Norris discloses oligomerizing at low temperatures of 50° to 175°C (122° to 347°F) (column 4, lines 39-40). In contrast, the present invention employs higher temperatures (392°-600°F) which enhance reactivity of the catalyst to form oligomers at conditions "more


severe than typical conditions used to conduct oligomerizations/polymerizations" (specification; page 6, lines 12-15). Finally, it is urged that neither Wilms nor Norris suggests the process of present claims 12, 14 and 16 wherein the hydrocarbon feedstock comprises greater than 50 ppm sulfur-containing compounds and up to about 1 wt.% (10000 ppm) of sulfur-containing molecules.

Given these distinctions, it is respectfully submitted that the subject matter of the present claims is neither disclosed nor suggested by the combination of Wilms and Norris. Accordingly, withdrawal of this rejection under 35 USC § 103(a) is respectfully requested.

CONCLUSION

Applicants respectfully submit that the foregoing arguments obviate all of the outstanding final rejections in this case and place the application in condition for immediate allowance. Allowance of this application is therefore earnestly solicited.

Respectfully submitted,

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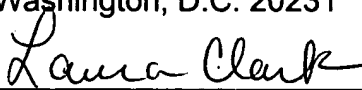
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